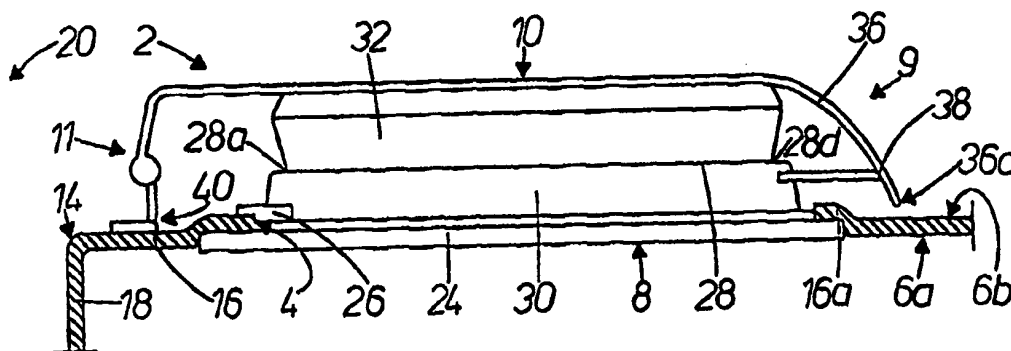




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>6</sup> : <b>B65D 5/74</b>	<b>A1</b>	(11) International Publication Number: <b>WO 98/18684</b> (43) International Publication Date: 7 May 1998 (07.05.98)
<p>(21) International Application Number: PCT/SE97/01595</p> <p>(22) International Filing Date: 23 September 1997 (23.09.97)</p> <p>(30) Priority Data: MI96A002274 31 October 1996 (31.10.96) IT</p> <p>(71) Applicant (for all designated States except US): TETRA LAVAL HOLDINGS &amp; FINANCE S.A. [CH/CH]; 70, avenue Général-Guisan, CH-1009 Pully (CH).</p> <p>(72) Inventors; and (75) Inventors/Applicants (for US only): RENDINA, Antonio [IT/IT]; Via Meucci, 2, I-41012 Carpi (IT). KARLSSON, Magne [SE/SE]; Magle Lilla Kyrkogata 8, S-223 51 Lund (SE). BREIVALD, Tord [SE/SE]; Gitarrvägen 11, S-245 42 Staffanstorps (SE).</p> <p>(74) Agent: BENTZ, Christer; AB Tetra Pak, Ruben Rausing's gata, S-221 86 Lund (SE).</p>	<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p>Published With international search report.</p>	

(54) Title: OPENING DEVICE ON A PACKAGING SHEET MATERIAL



## (57) Abstract

An opening device (2) attached at a hole (4) in a top wall portion (16) of a packaging container (12) and positioned adjacent a fold line (14) of the packaging container, including a base portion (8) connected to the top wall at the hole, and a lid portion (10) releasably connected to the base portion, in which the base portion has a portion (26) protruding from a main circumferential portion (24) towards the fold line (14), for providing increased stability of the container during storage and transport. A tamper evidence protrusion (11), also functioning as a pull tab for opening the lid portion, extends from the lid portion to be connected to an outer side (6b) of the top wall portion. A reduced thickness tearing edge (28) is provided between the base portion and the lid portion for facilitating opening, and a bistable hinge (9) releasably biases the lid portion to stably remain in an open position, for avoiding interference of the lid portion during product dispensing. The base portion has an upper ring portion (30) and the lid portion has a lower ring portion (32) which after the release of the lid portion from the base portion may be mutually intermated in a releasably locked manner, so as to reseal the opening device.

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Opening Device On a Packaging Sheet MaterialTechnical Field

The present invention relates to an opening device provided at a hole in a packaging sheet material. In particular, the invention relates to a synthetic plastics material opening device which has been directly injected moulded on the sheet.

Background Art

Opening devices of different types provided on a packaging container formed by packaging sheet material and adapted for containing substances such as foodstuffs, and in particular for containing liquid beverages such as juices, water, milk, wine, etc. are known.

Examples of such opening device include a hole on a wall part of the packaging container and a plastics material lid device attached to the wall part and covering the hole in a closed state. The lid device includes a circumferential base attached to the wall part, for example by means of adhesives, circumferentially surrounding the hole, and a lid element hinged to the base. The hole may be a perforation, and once the lid element is opened, the perforation may be engaged and forced open so that the contents inside the packaging container may be dispensed therefrom. Alternatively the hole may be a circumferential hole punched in the sheet. A sealing element such as an aluminium pull tab is connected to the wall part so as to cover the opening, and once the lid element has been opened, the sealing element may be removed to expose the opening for dispensing the contents of the packaging container.

Opening devices which include a perforated hole on the sheet present the disadvantage that when the perforation is broken by the user, material portions from the perforation may become dislodged from the sheet and mix with the contents inside the container. In the case of opening devices which include a hole punched in the sheet, the provision of the sealing element connected to the sheet for closing the hole adds additional requirements for apparatus and method steps for forming the opening device on the sheet, thereby reducing the overall efficiency of the formation of the opening device on the sheet. Both these types of opening devices also have the disadvantage that a separate lid device must be attached to the sheet, in which the lid device

is formed in a separate method and apparatus thereby adding costs related to a separate manufacturing line and to separate storage and transport of the lid devices so as to even further reduce the efficiency of the opening device formation on the lid.

5        Moreover, both these types of opening devices are subject to the problem of edge soaking, in which the edge of the perforation or hole in the sheet comes into contact with the contents of the package thereby to compromise the stability of the sheet and package. Generally, the packaging sheet material is formed of several layers including an inner paper layer and  
10 two outer synthetic plastics material coating layers, one of which is destined to form a product contact surface. Other possible layers such as printing ink layers, laminating layers and aluminium foil layers may be interposed between the paper layer and the outer coating layers. The hole or perforation in the sheet will expose the internal layers of the sheet at such hole or perforation,  
15 and unless such edge is adequately sealed the packaged product may come into contact with the internal layers of the packaging sheet material possibly causing damage to the product and/or the package. In the case of the opening devices provided with a circumferential hole, extra steps have been taken to provide a patch for sealing the hole edge, which however even further reduces  
20 the efficiency in the opening device manufacture.

A further problem encountered in the above-described opening devices, due to the fact that the base is positioned circumferentially distant from the hole or perforation, is that after a certain amount of product is poured out of the container, residual product often remains inside the lid device, in  
25 contact with the outer surface of the sheet between the hole or perforation and the base of the lid device. Precise placement of the base on the sheet so that it is flush with the hole is unfeasible, and the consequence of residual product left in contact with the outer surface of the container is fastidious to the user. Moreover, in these known opening devices, while the lid device may be  
30 reclosable, once the perforation or hole has been opened, the package is not resealable in the sense that the hole or perforation is not itself reclosed or resealed.

As an alternative to the above opening devices, in which an already formed plastics material lid device is applied to the sheet, U.S. Patent No.

4,725,213 discloses a plastics material opening device which is injection moulded directly onto the sheet of packaging material. In particular, a pair of mould tools are moved into arrangement about a prestamped hole in the sheet, and heated thermoplastics material is injected through an injection  
5 passage defined between one of the mould tools and one surface of the sheet and extending along such surface of the sheet in order to form the opening device at the prestamped hole. The mould tools are shaped so that the formed opening device includes a pair of circumferential flange portions each of which is attached to the opposite surfaces of the sheet at the edge of the prestamped  
10 hole, thereby attaching the opening device to the sheet.

The mould tools consist of a pair of mould tools which are both movable in opening and closing directions which extend perpendicularly to the extension of the sheet. Such a moulding configuration in U.S. Patent No. 4,725,213 substantially limits the flexibility of the device in forming opening  
15 devices which different shapes, since the mould tools in their release movement must not encounter any portions of the opening device which protrude in a direction perpendicular to the direction of movement of the mould tools.

The opening device in U.S. Patent No. 4,725,213 moreover includes a  
20 lid which is torn off at weakened lines without any provision for reclosing or resealing of the package after the lid is removed.

Another problem encountered with conventional opening devices attached to packaging material sheets is that the opened lid portion frequently is positioned to hinder the dispensing operation of the contents of the  
25 package.

Another problem which exists with opening devices attached to sheet holes consists in that the provision of the hole in the sheet frequently weakens the mechanical strength of the sheet. Packages made of these sheets with opening devices attached at the sheet holes are generally stored and shipped  
30 in stacks, and the weakening of the sheet at the holes may lead to collapse and damage of the container during shipping and storing. A possible solution for compensating for the sheet hole weakness would be to provide opening devices having parts extending for large areas about the sheet hole. However, such provisions would lead to increased manufacturing costs due to

increase in material requirements and production difficulties and inefficiency in forming and attaching the larger parts to the sheet. In the case of direct injection moulding of the opening device, for example, increased times would be required for injecting into larger mould cavities, leading to a significant  
5 decrease of efficiency of the production line.

It is seen that there exists a need in the field of packaging sheet material opening devices to provide opening devices having an improved functionality. Moreover, it is desirable that opening devices provided at holes in sheets are of such a nature so as to be manufacturable in the most effective and efficient  
10 manner possible.

#### Disclosure of the Invention

In accordance with one preferred aspect of the invention, there is provided an opening device attached at a hole in a top wall portion of a packaging container and positioned adjacent a fold line of the packaging  
15 container, in which a base portion of the opening device includes a main circumferential portion circumferentially enclosing the extension of the hole and a protruding portion which protrudes from the main circumferential portion towards the fold line. The extension of the protruding portion towards the fold line of the container allows to strengthen the packaging material sheet by  
20 distributing forces to the fold line, such that containers provided with the opening device may be stacked for storage and transport without collapse. Moreover, the protruding portion constitutes a small portion of the base portion with respect to the main circumferential portion, so as to maintain efficiency of manufacture of the opening device by requiring minimised material amounts  
25 and simplified procedures.

The opening device according to another preferred aspect of the invention includes a tamper evidence protrusion which extends from a lid portion of the opening device to be connected to an outer side of the sheet. A user is therefore assured that the container has not been tampered with when  
30 the tamper evidence protrusion is stably connected to the outer side of the sheet. Such tamper evidence protrusion further functions as a pull tab for opening the lid portion.

In accordance with still another aspect of the invention, a reduced thickness tearing edge is provided between the base portion and the lid

portion. In a preferred embodiment, first and second end portions of the tearing edge are thinner still than two connecting lateral portions of the tearing edge, so that the initial and final tearing actions of the lid are extremely easy thereby to reduce undesirable abrupt movements to the container at the initial  
5 and final tearing actions and to make the entire removal procedure of the lid portion essentially smooth and uniform.

The opening device according to a further aspect of the invention, there are provided lower and upper ring portions respectively of a lid portion and a base portion of the opening device which are mutually connected by a tearing  
10 edge. Once the lid portion has been removed from its connection with the base portion, the upper and lower ring portions may be mutually intermated in a releasably locked manner, so as to reseal the opening device. In a most preferred embodiment, one of the ring portions is releasably lodged inside the other ring portion in a snap-type arrangement.

15 The opening device according to another preferred aspect of the invention includes a bistable hinge connecting the lid portion to the base portion, such that in the open position of the lid portion with respect to the base portion, the bistable hinge releasably biases the lid portion to stably remain in its open position.

20 The technical characteristics and advantages of the present invention will become apparent to those skilled in the art from the following detailed description of some preferred embodiments thereof, described and illustrated in the accompanying drawings only by way of non-limitative example, wherein like reference numerals indicate like parts.

## 25 Brief Description of Drawings

Fig. 1 is a top plan view of an opening device attached to a packaging sheet material according to one preferred embodiment of the invention;

Fig. 2 is a side elevation view of the configuration of Fig. 1 in which the sheet is shown in cross-section taken in the plane I-I of Fig. 1;

30 Fig. 2a is a detail side elevation view of a bistable hinge of the opening device of Figs. 1 and 2 shown in an open position;

Fig. 3 is a cross-sectional rear elevation view of the opening device of the previous Figs. 1-2a taken in the plane II-II of Fig. 1;

Fig. 3a is a view similar to that of Fig. 3 however with a lid portion of the

opening device lodged in base portion of the opening device in a resealed condition;

Fig. 4 is a side elevation view similar to that of Fig 2 showing an opening device according to a second preferred embodiment of the invention;

5 and

Fig. 5 is a bottom plan view of the opening device of Fig. 4 seen from the plane V-V.

#### Best Mode(s) for Carrying Out the Invention

With initial reference to Figs. 1-3, there is shown an opening device 2  
10 attached at a hole 4 provided in a packaging material sheet 6. Opening device 2 includes a base portion 8 connected to sheet 6 at hole 4 and a lid portion 10 releasably connected to base portion 8. Lid portion 10 is connected to base portion by means of a hinge element 9, and a tamper evidence protrusion 11, functioning also as a pull tab for releasing lid portion 10 from  
15 base portion, extends from lid portion 10 and connects to the outer side 6b of sheet 6.

In the embodiment shown, packaging material sheet 6 is folded at a plurality of fold lines and sealed in a known manner to form a packaging container 12 for containing products, in particular alimentary products. In the  
20 preferred embodiment sheet 6 is a synthetic plastics coated paper carrier material, and packaging container 12 is folded to have a shape of a brick. Apparatus and methods for folding and sealing sheets for forming packaging containers, and for filling the packaging containers with product are known. One example of a machine for forming, filling, and sealing packaging  
25 containers is the TB8 filling machine manufactured by Tetra Brik Packaging Systems of Modena, Italy.

Figs. 1-3 show a portion of packaging container 12, in which sheet 6 is folded at a fold line 14 to form a top wall portion 16 and a side wall portion 18 of container 12. Hole 4 and opening device 2 are arranged at top wall portion  
30 16, adjacent fold line 14, for facilitating pouring of product out of container 12 by tilting container 12 over side wall portion 18 in direction 20 (Fig. 2). When lid portion 10 is removed from base portion 8, product may be dispensed from container 12 through an opening 22 of base portion 8 arranged in correspondence with hole 4 in sheet 2.

Base portion 8 includes a main circumferential portion, in the form of an inner flange portion 24 arranged in contact with the inner side 6a of sheet 6, which is larger than the extension of hole 4 so as to circumferentially enclose the extension of hole 4. In accordance with one preferred aspect of the invention, base portion 8 further includes a protruding portion which protrudes from main circumferential portion 24 towards fold line 14. The protruding portion in the embodiment shown is in the form of an outer flange projection 26 arranged in contact with the outer side 6b of sheet 6.

The extension of protruding portion 26 towards fold line 14 of container 12 allows to strengthen packaging material sheet 6 by distributing forces to fold line 12, so as to prevent damage of sheet 6 from occurring around hole 4 during stacking and transportation of containers 12 provided with opening device 2. Moreover, protruding portion 26 constitutes a relatively small portion of base portion 8 with respect to main circumferential portion 24, so as to maintain efficiency of manufacture of opening device 2 by requiring minimised material amounts and less time consuming procedures.

Opening device 2 is preferably formed of synthetic plastics material directly injection moulded on sheet 6, in a manner such that base portion 8 extends in a longitudinal plane which is substantially parallel to the plane of extension of sheet top wall portion 16. Opening device 2 may be formed by inner and outer mould tools arrangeable in moulding position respectively in contact with the sheet inner side 6a and the sheet outer side 6b so as to form a mould cavity in which hole 4 is arranged, and subsequently in which heated thermoplastics material is injected. The outer mould tool may include a pair of half mould tools, which at least in the release movement from the moulding position after opening device has been injection moulded include a directional component of movement parallel to the extension of sheet 6, as indicated by arrows R in Fig. 3, thereby to allow to form portions of opening device such as hinge 9 and tamper evidence protrusion 11.

Connection of various parts of opening device 2, such as tamper evidence protrusion 11 and base portion 8, to sheet 6 is facilitated when opening device 2 is directly injection moulded and sheet 6 is a synthetic plastics coated paper carrier material, since the injected heated thermoplastics material effectively fuses with the plastics coated layer of sheet 6. Opening

device 2 may be formed by a mould tool configuration which is such as to provide a slightly raised or embossed portion 16a of sheet top wall portion 16 in correspondence with main circumferential portion 24 of base portion 8.

Opening device 2 may be directly injection moulded on sheet 6 in a continuous production line including a reel of a web of packaging sheet material, a drive for unwinding the web from the reel and feeding the unwound web through the production line, a hole punching station for punching holes in the unwound web, a moulding station for directly injection moulding opening devices 2 at holes punched in the web, and a folding, filling, sealing and cutting station for forming packaging containers 12 filled with product and incorporating opening devices 2. Opening device 2 may be directly injection moulded on packaging sheet material 6 of any type and shape. For example, sheet 6 may be a continuous web of packaging material, or a blank of packaging material, or a protruding flap of packaging material, to mention only a few. Methods and apparatus for performing the above described manufacturing operations are disclosed in the patent application concurrently filed by the same applicant of this application entitled "Apparatus and Method for Moulding An Opening Device on a Packaging Sheet", the disclosure of which is incorporated herein by reference.

When opening device 2 is injection moulded on sheet 6, protruding portion 26 is formed in a portion of the mould cavity which is relatively small and accordingly the time required for properly filling the mould cavity is minimised in order to maximise the efficiency of the formation of opening device 2.

In accordance with another advantageous aspect of the invention, in an initial unopened state of opening device 2, lid portion 10 is connected to base portion 8 at a circumferential tearing edge 28 which has a reduced thickness with respect to the thickness of the adjacently arranged portions of base portion 8 and lid portion 10. In a preferred embodiment, base portion 8 has an upper ring-shaped portion 30 and lid portion 10 has a lower ring-shaped portion 32, and tearing edge 28 is provided between lower ring portion 32 and upper ring portion 30. In one most preferred embodiment, tearing edge 28 includes a first end portion 28a arranged adjacent tamper evidence protrusion 11 for an initial tearing of tearing edge 28 and an initial release of lid portion

10 from base portion 8, two lateral portions 28b and 28c for successive tearing of tearing edge 28 to progressively release lid portion 10 from base portion 8, and a second end portion 28d arranged adjacent hinge element 9 for a final tearing of tearing edge 28 and a final release of lid portion 10 from base  
5 portion 8. At least one and preferably both of first and second end portions 28a and 28d have a thickness which is less than the thickness of lateral portions 28b and 28c, so as to advantageously provide initial and final tearing actions of lid portion 10 which are extremely easy thereby to reduce undesirable abrupt movements to packaging container 12 at the initial and  
10 final tearing actions and to make the entire removal procedure of lid portion 10 essentially smooth and uniform.

Circumferential tearing edge 28, upper ring portion 30 of base portion 8, and lower ring portion 32 of lid portion 10 may be provided by injection moulding in which the moulding tools are appropriate configured to form these  
15 elements. Similar considerations apply to protruding portion 26 connected to upper ring portion 30, to hinge element 9 interconnected between upper ring portion 30 and lid portion 10, and to tamper evidence protrusion 11 interconnected between lid portion 10 and sheet top wall portion 16.

Reduced thickness tearing edge 28 provides an effective means for a  
20 smooth and non-abrupt release of lid portion 10 from base portion 8. Moreover, tearing edge 28 constitutes the only element in opening device 2 which need be provided and which need be released by a user for providing an opening mechanism in opening device 2, thereby increasing simplicity in use for the user and increasing efficiency in forming opening device 2. Base  
25 portion 8 also fully seals edge of hole 4 thereby to eliminate edge soaking phenomenon, and upper ring portion 30 of base portion 8 is configured to extend from the inside of packaging container 12 so that products may be dispensed directly through upper ring portion 30 so as to eliminate the phenomenon of residual products remaining about the hole in the packaging  
30 material sheet as occurs in known devices.

In accordance with another preferred aspect of the invention, upper ring portion 30 and lower ring portion 32 are reclosable after lid portion 10 has been released from base portion 8 such that upper and lower ring portions 30 and 32 have mutually mating surfaces which releasably lock upper ring

portion 30 with said lower ring portion 32. In the illustrated embodiment, Fig. 3a shows the releasably locked position in which lower ring portion 32 is releasably lodged inside upper ring portion 30 such that the outer surface 32a of lower ring portion 32 mates with the inner surface 30a of upper ring portion 30. During the initial insertion of lower ring portion 32 into upper ring portion 30, the broken circumferential tearing edge 28 itself provides a small amount of resistance which requires a small amount of elastic deformation of one or both of upper and lower ring portions 30 and 32 so that lower ring portion 32 may be inserted into upper ring portion 30.

As seen in Fig. 3, outer surface 32a of lower ring portion 32 tapers towards a maximum circumferential extension which is larger than the circumferential extension of tearing edge 28. This particular configuration creates a further resistance as lower ring portion 32 is further inserted into upper ring portion 30 which requires a further amount of elastic deformation of one or both of upper and lower ring portions 30 and 32 so that lower ring portion 32 may be fully inserted into upper ring portion 30, with a type of snap-together action. Inner surface 30a of upper ring portion 30 tapers towards tearing edge 28 so as to have a substantially matching configuration with tapered outer surface 32a of lower ring portion 32. The release of upper ring portion 30 from its lodgement inside lower ring portion 32 requires an elastic deformation of one or both of upper and lower ring portions 30 and 32, in a manner such that the particular configuration of upper and lower ring portions 30 and 32 advantageously provides not only a reclosing function but also a resealing function for opening device 2. It is envisaged that the configuration of upper and lower ring portions 30 and 32 may be reversed such that the upper ring portion is lodged in a snap-type arrangement within lower ring portion for achieving these same advantageous affects.

Lid portion 10 advantageously remains connected to base portion 8 even in the released position by means of hinge element 9. According to another advantageous aspect of the invention, hinge element 9 is a bistable hinge connecting lid portion 10 with base portion 8 such that in a first stable position lid portion 10 extends in a position adjacent base portion 8, and such that in a second stable position lid portion 10 is rotated to be substantially completely open with respect to base portion 8 in which bistable hinge

element 9 releasably biases lid portion 10 to remain in the second stable position (Fig. 2a).

According to a preferred embodiment, bistable hinge 9 includes a first tab 34 connected to and extending from base portion 8, and a second flexible  
5 tab 36 connected to and extending from lid portion 10. First and second tabs 34 and 36 are mutually connected at a connecting portion 38, and second tab 36 extends past connecting portion 38 with respect to lid portion 10 for a  
sufficient extension such that when lid portion 10 is in the second stable position the end 36a of second tab 36 engages with sheet top wall portion 16  
10 and first tab 34 biases second tab 36 to remain engaged with sheet top wall portion 16. Therefore the particular configuration of bistable hinge 9 is such that from the second stable position as seen in Fig. 2a, first tab 34 is essentially in its unflexed normal condition, and in order to pivot lid portion 10 back toward base portion 8, end 36a of second tab 36 would slide against  
15 sheet top wall portion 16 and the protruding portion of second tab 36 extending past connecting portion would cause first tab 34 to move upwardly out of its non-flexed state. First tab 34 therefore biases second tab 36 to remain in the second stable position of Fig. 2a, and the biasing action provided by first tab 34 needs to be overcome for repositioning lid portion 10  
20 into its first position.

Bistable hinge 9 therefore advantageously provides an effective means for maintaining lid element 10 in its open position so that it does not cause a hindrance to dispensing product from packaging container 12 provided with opening device 2. Bistable hinge 9 is also advantageously of a simple and  
25 cost-effective construction.

Opening device 2 according to another preferred aspect of the invention includes tamper evidence protrusion 11 which extends from lid portion 10 to be connected to outer sheet side 6b. A user is therefore assured that container 12 has not been tampered with when tamper evidence protrusion 11  
30 is stably connected to outer sheet side 6b. Tamper evidence protrusion 11 further functions as a pull tab for opening the lid portion. As seen in Fig. 2, tamper evidence protrusion 11 is connected to outer sheet side 6b at a point 40 which is distal from where base portion 8 is connected to sheet top wall portion 16, so as to advantageously form a type of gap which allows tamper

evidence protrusion 11 to be effectively gripped by a user.

Figs. 4-5 show an opening device 102 according to another embodiment of the invention, wherein reference numerals with the addition of asterisks indicate parts completely identical to parts referenced by the same numerals in Figs 1-3. In a variation to previous opening device 2, opening device 102 includes a base portion 108 with an upper ring portion 30', however outer flange projection 26 is not provided on base portion 108. Base portion 108 still includes a main circumferential portion in the form of an inner flange portion 124, however the protruding portion which protrudes from main circumferential portion 124 towards fold line 14' is instead in the form of an inner projection 126 extending from inner flange portion 124 and arranged in contact with sheet inner side 6a'.

The extension of protruding inner flange portion 124 towards fold line 14' of container 12' also allows to strengthen packaging material sheet 6' by distributing forces to fold line 12', similarly to outer flange projection 26 of Figs. 1-3, so as to prevent damage of sheet 6' from occurring around hole 4' during stacking and transportation of containers 12' provided with opening device 102. Moreover, protruding portion 126 constitutes a relatively small portion of base portion 108 with respect to main circumferential portion 124, so as to maintain efficiency of manufacture of opening device 102 by requiring minimised material amounts and less time consuming procedures. It is furthermore possible to provide both inner flange portion 124 and outer flange projection 26 on the same opening device, so as to simultaneously achieve the advantageous affects of sheet strengthening and efficiency in manufacture.

While the embodiments of the invention illustrated in the drawing Figures include opening devices 2 and 102 attached to a packaging sheet material adjacent a fold line of the packaging sheet material, it is possible to attach an opening device in accordance with the present invention to various types of packaging sheet materials and at locations thereof which are not necessarily adjacent an fold line, while still achieving similar functionality and similar advantageous results according to various aspects of the disclosed invention. For example an opening device according to the invention may be attached to a packaging material which forms a rounded pouch container without distinct fold lines, and many of the advantageous affects of the

invention will still be achieved. Moreover, other shapes of the packaging container, in addition to that of a brick shape, are possible to obtain which incorporate the present opening device. By way of example, the side wall portion of the packaging container may be cylindrical in form, and the angle of bending at the fold edge may be different than the square angle as illustrated in the drawings.

In particular, an opening device according to the invention including one or more, and in any combination, of the disclosed features of the bistable hinge, of the tamper evidence protrusion, of the circumferential tear edge, of the reclosable and resealable configuration of the base and lid portions, and of the general configuration of the base and lid portions, to name just a few of the disclosed features, may be attached to any hole provided in any type of packaging material so as to still achieve the advantageous effects of the invention disclosed herein.

Claims

1. A packaging container formed of a packaging material sheet folded at fold lines to form a top wall portion of the packaging container and at least one side wall portion of the container, and an opening device attached to the top wall portion of the packaging container at a hole provided in the top wall portion and positioned adjacent at least one fold line of the packaging container, the opening device comprising:
- a base portion connected to the sheet at said hole; and
  - a lid portion releasably connected to the base portion;
- 10 wherein said base portion comprises a main circumferential portion being larger than the extension of said hole and circumferentially enclosing the extension of said hole; and
- wherein said base portion further comprises a protruding portion which protrudes from said main circumferential portion towards said fold line.
- 15 2. The combination of claim 1 wherein said main circumferential portion comprises an inner flange portion arranged in contact with an inner side of the sheet, and wherein said protruding portion comprises an outer flange projection arranged in contact with an outer side of the sheet.
3. The combination of claim 1 wherein said main circumferential portion comprises an inner flange portion arranged in contact with an inner side of the sheet, and wherein said protruding portion comprises an inner projection extending from said inner flange portion and arranged in contact with the inner side of the sheet.
- 20 4. The combination of claim 1 further comprising a tamper evidence protrusion which extends from said lid portion and which is connected to an outer side of the sheet at a point which is distal from where said base portion is connected to said sheet.
5. The combination of claim 1 wherein said lid portion is connected to said base portion at a circumferential tearing edge, said tearing edge having a reduced thickness with respect to the thickness of adjacently arranged portions of said base portion and said lid portion, said tearing edge comprising:
- a first end portion for an initial tearing of said tearing edge and an initial release of said lid portion from said base portion;
- 30

two lateral portions for successive tearing of said tearing edge and a successive release of said lid portion from said base portion; and

a second end portion for final tearing of said tearing edge and a final release of said lid portion from said base portion;

5 wherein at least one of said first and second end portions has a thickness which is less than the thickness of said lateral portions.

6. The combination of claim 5 wherein said lid portion has a lower ring portion and said base portion has an upper ring portion, said tearing edge being provided between said lower ring portion and said upper ring portion,  
10 said upper ring portion and said lower ring portion being reclosable after said lid portion has been released from said base portion such that said upper and lower ring portions have mutually mating surfaces which releasably lock said lower ring portion with said upper ring portion.

7. The combination of claim 6 wherein in the releasable locked  
15 position, one of said ring portions is releasably lodged inside the other of said ring portions, and said mutually mating surfaces comprise a surface portion of said one of said ring portions which has a circumferential extension larger than the circumferential extension of said tearing edge.

8. The combination of claim 1 wherein said opening device is a  
20 synthetic plastics material opening device directly injected moulded on the packaging material sheet.

9. An opening device for attachment to a hole of a packaging material sheet, the opening device comprising:

a base portion connectable to the sheet at said hole; and  
25 a lid portion releasably connected to the base portion;

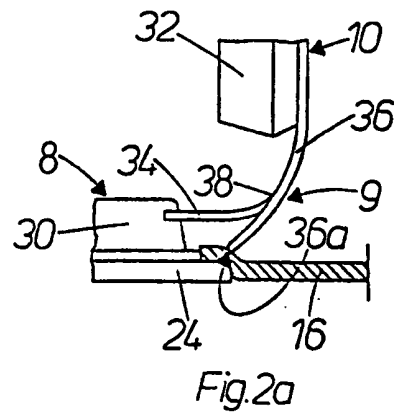
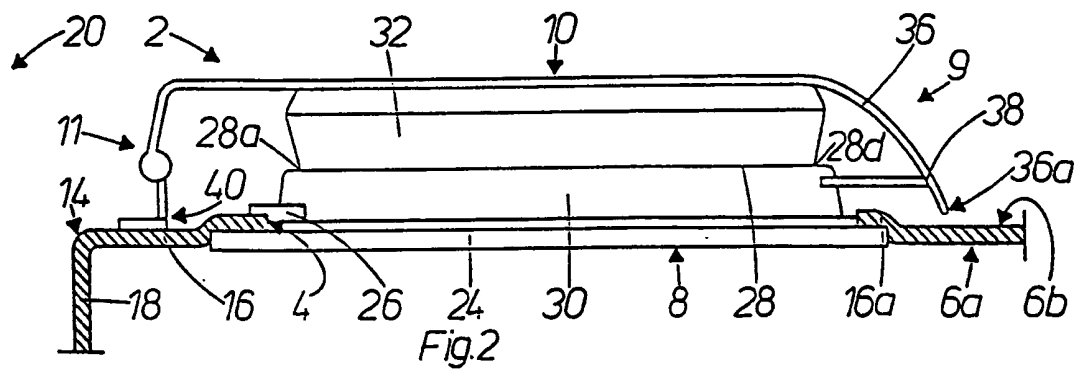
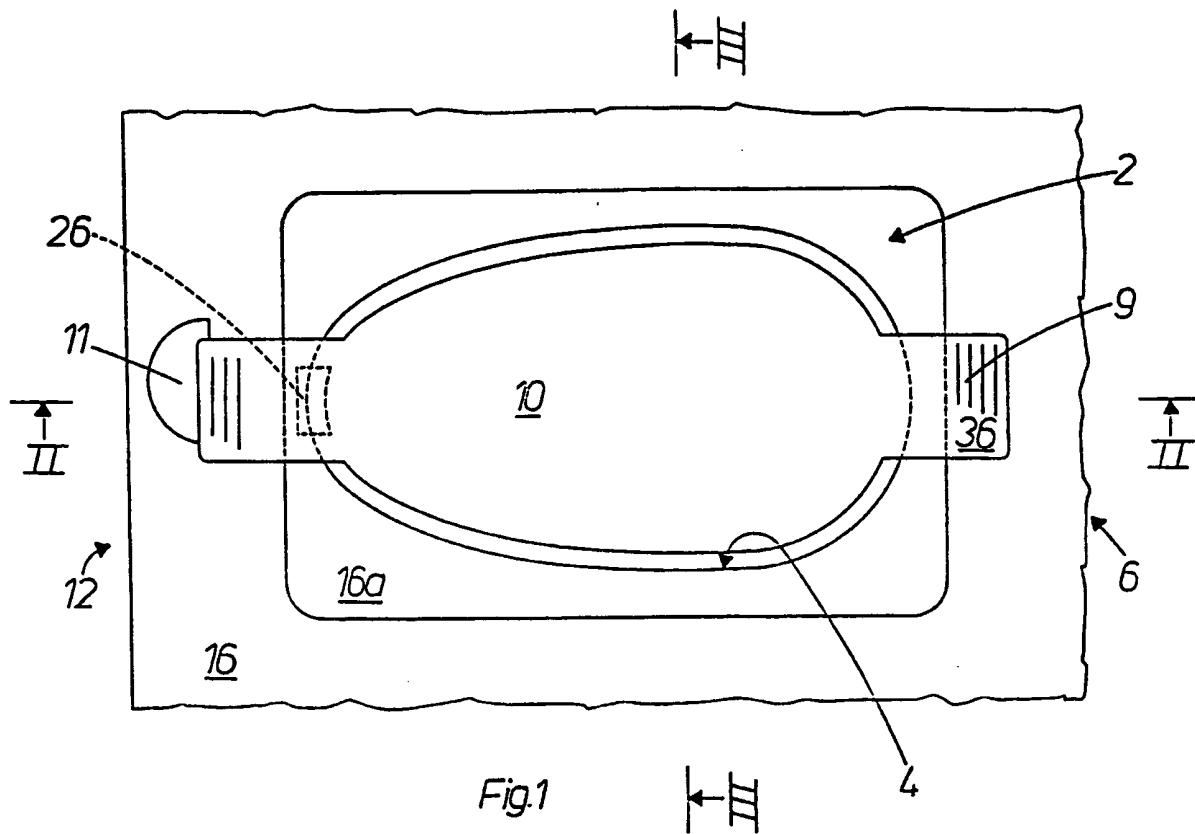
wherein said lid portion has a lower ring portion and said base portion has an upper ring portion, said lower ring portion and said upper ring portion being mutually releasably connected, said upper ring portion and said lower ring portion being reclosable after said lid portion has been released from said  
30 base portion such that said upper and lower ring portions have mutually mating surfaces which releasably lock said lower ring portion with said upper ring portion.

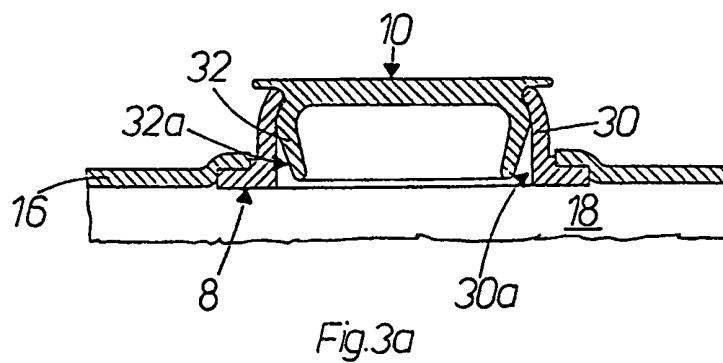
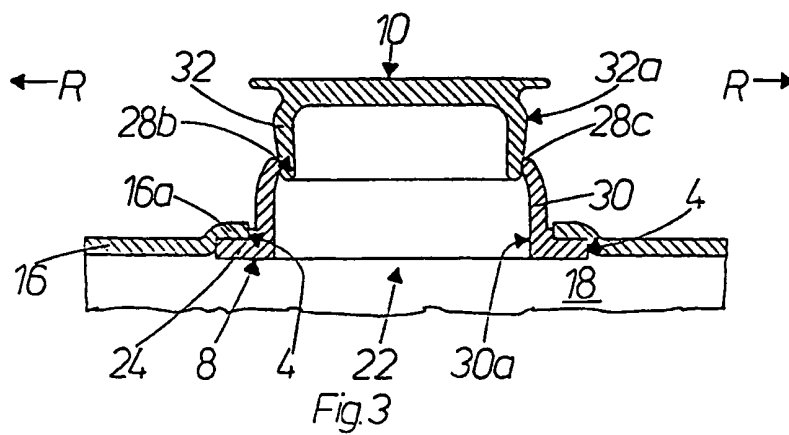
10. The device of claim 9 wherein in the releasable locked position, one of said ring portions is releasably lodged inside the other of said ring

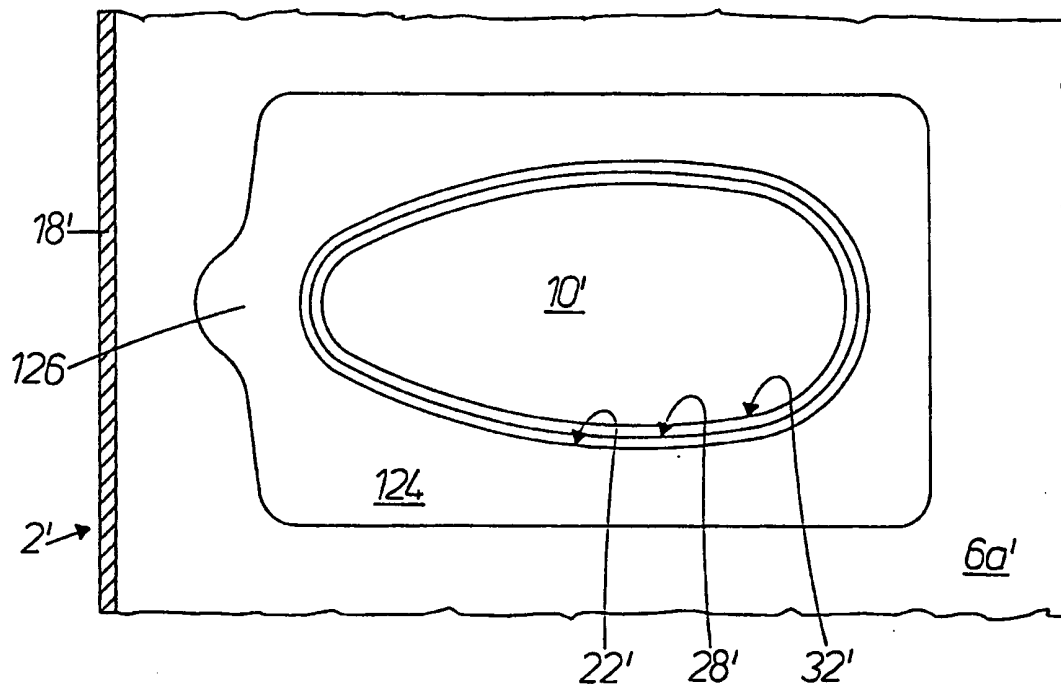
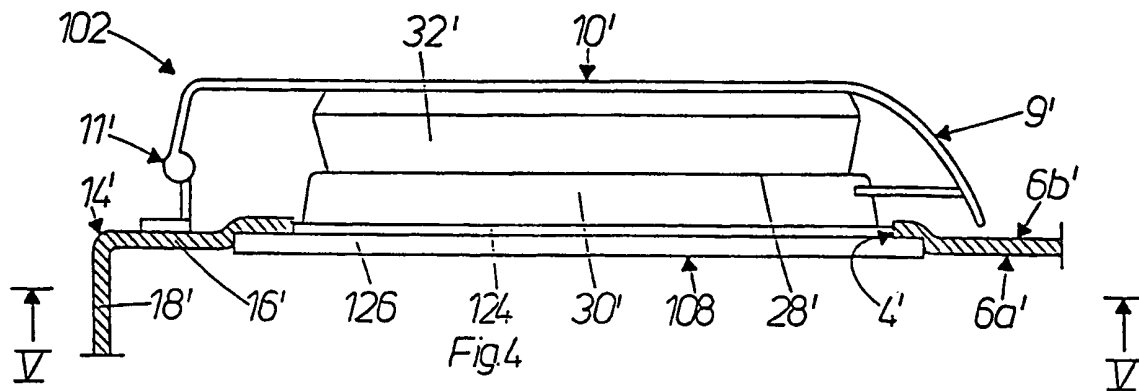
portions, and said mutually mating surfaces comprise a surface portion of said one of said ring portions which has a circumferential extension larger than the circumferential extension of said tearing edge.

11. The device of claim 10 wherein said opening device is a  
5 synthetic plastics material opening device directly injected moulded on the sheet, and wherein said sheet is a synthetic plastics coated paper carrier material.

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# INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 97/01595

## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B65D 5/74

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0686568 A2 (TETRA LAVAL HOLDINGS & FINANCE SA), 13 December 1995 (13.12.95), figure 5, abstract ---	1,2,3,9,10
P,X	WO 9709238 A1 (RICAL), 13 March 1997 (13.03.97), figure 4, abstract ---	1,2,9,10
X	WO 9507844 A1 (THE PROCTER & GAMBLE COMPANY), 23 March 1995 (23.03.95), page 7, line 17 - line 32; page 8, line 20 - line 23, figure 2, claim 4 ---	1,2,9,10



Further documents are listed in the continuation of Box C.



See patent family annex.

\*

Special categories of cited documents:

"A"

document defining the general state of the art which is not considered to be of particular relevance

"E"

earlier document but published on or after the international filing date

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document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O"

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document published prior to the international filing date but later than the priority date claimed

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later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X"

document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y"

document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"

document member of the same patent family

Date of the actual completion of the international search

20 December 1997

Date of mailing of the international search report

12 -01- 1998

Name and mailing address of the ISA/

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# INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 97/01595

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3998354 A (SONG), 21 December 1976 (21.12.76), figures 3,4 --	5
A	US 5348183 A (LUCH ET AL), 20 Sept 1994 (20.09.94), figures 5,6, abstract --	5
A	EP 0303976 A2 (TETRA PAK FINANCE & TRADING S.A.), 22 February 1989 (22.02.89), figure 3 -- -----	5

# INTERNATIONAL SEARCH REPORT

Information on patent family members

02/12/97

International application No.

PCT/SE 97/01595

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0686568 A2	13/12/95	AU 1783995 A CA 2151167 A CH 687252 A JP 8053150 A US 5632440 A	21/12/95 11/12/95 31/10/96 27/02/96 27/05/97
WO 9709238 A1	13/03/97	AU 6878396 A FR 2738552 A,B	27/03/97 14/03/97
WO 9507844 A1	23/03/95	AT 145376 T AU 7830494 A DE 69306111 D EP 0645315 A,B	15/12/96 03/04/95 00/00/00 29/03/95
US 3998354 A	21/12/76	NONE	
US 5348183 A	20/09/94	AU 653779 B AU 1134092 A CA 2062008 A EP 0502716 A JP 5196141 A MX 9200986 A US 5174465 A US 5249695 A US 5271519 A US 5303837 A US 5348182 A US 5348184 A US 5397013 A US 5512228 A US 5597082 A US 5678719 A WO 9215496 A	13/10/94 10/09/92 06/09/92 09/09/92 06/08/93 01/09/92 29/12/92 05/10/93 21/12/93 19/04/94 20/09/94 20/09/94 14/03/95 30/04/96 28/01/97 21/10/97 17/09/92
EP 0303976 A2	22/02/89	SE 0303976 T3 AU 614534 B AU 2114488 A CA 1304324 A DE 3727589 A DE 3884886 D ES 2045039 T FI 92309 B,C JP 1084846 A KR 9514818 B RU 2002683 C US 4895298 A	05/09/91 23/02/89 30/06/92 02/03/89 00/00/00 16/01/94 15/07/94 30/03/89 15/12/95 15/11/93 23/01/90